CLAIMS

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| _ | 4. | n gas detector comprising. |
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| 2 | | a first electrically conductive material layer; |
| 3 | | an electrically nonconductive material layer disposed on the first electrically |
| 4 | | conductive material layer; |
| 5 | | a second electrically conductive material layer disposed on the electrically |
| 6 | | nonconductive material layer; |
| 7 | | a gas source in fluid communication with the second electrically conductive |
| 8 | | material layer; and |
| 9 | | a power source in electrical communication with the first and second |
| 10 | | electrically conductive material layers. |
| | | |
| 1 | 2. | The gas detector according to claim 1, wherein the first electrically |
| 2 | | conductive material layer contains a metal selected from the group consisting |
| 3 | | of aluminum, magnesium, chromium, titanium and zirconium. |
| | | |
| 1 | 3. | The gas detector according to claim 1, wherein the second electrically |
| 2 | | conductive material layer contains a metal selected from the group consisting |
| 3 | | of silver, gold, platinum, rhodium, iridium, palladium, ruthenium, and |
| 4 | | osmium. |
| | | |
| 1 | 4. | The gas detector according to claim 3, wherein the second electrically |
| 2 | | conductive material layer contains gold. |
| | | |
| 1 | 5. | The gas detector according to claim 1, wherein the electrically nonconductive |
| 2 | | material layer contains at least one compound selected from the group |
| 3 | | consisting of aluminum oxide, magnesium oxide, chromic oxide, titanium |
| 4 | | dioxide, zirconium oxide, and silicon dioxide. |
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| 1 | 6. | The gas detector according to claim 1, wherein the gas detector is capable of |
| 2 | | detecting sulfur dioxide. |

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7. The gas detector according to claim 1, wherein the power source is a direct current power source.

- 1 8. The gas detector according to claim 1, wherein the power source is an alternating current power source.
- 9. A method of determining the presence of a gas, the method comprising 1 2 determining the change in impedance of a tunnel junction device upon 3 exposure to a gas sample, wherein the tunnel junction device contains a first 4 electrically conductive material layer, an electrically nonconductive material 5 layer disposed on the first electrically conductive material layer, and a second 6 electrically conductive material layer disposed on the electrically 7 nonconductive material layer, and wherein the first and second electrically 8 conducting layers are in electrical communication with a power source.
- 1 10. The method according to claim 9, wherein the gas to be detected is sulfur dioxide.
- 1 11. The method according to claim 9, wherein the first electrically conductive 2 material layer contains a metal selected from the group consisting of 3 aluminum, magnesium, chromium, titanium and zirconium.
- 1 12. The method according to claim 9, wherein the second electrically conductive 2 material layer contains a metal selected from the group consisting of silver, 3 gold, platinum, rhodium, iridium, palladium, ruthenium, and osmium.
- 1 13. The method according to claim 12, wherein the second electrically conductive material layer contains gold.
- 1 14. The method according to claim 10, wherein the gas is obtained from wine.
- 1 15. The method according to claim 9, wherein the power source is a direct current power source.

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| 1 | 16. | The method according to claim 9, wherein the power source is an alternating |
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| 2 | | current power source. |
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| 1 | 17. | The method according to claim 9, wherein the first and second electrically |
| 2 | | conducting layers are placed in electrical communication with a direct current |
| 3 | | power source and an alternating current power source and wherein the direct |
| 4 | | current and alternating current impedances are measured before and after |
| 5 | | exposure of the second conducting material layer to the sample. |
| | | |
| 1 | 18. | A method of making a gas detector comprising: |
| 2 | | forming a first electrically conductive material layer; |
| 3 | | disposing an electrically nonconductive material layer on the first electrically |
| 4 | condu | ctive material layer; |
| 5 | | disposing a second electrically conductive material layer on the electrically |
| 6 | nonco | nductive material layer; |
| 7 | | placing the first and second electrically conducting layers in electrical |
| 8 | comm | unication with a power source. |
| | | |
| 1 | 19. | The method of claim 18, wherein the second electrically conductive layer is |
| 2 | | selected from the group consisting of silver, gold, platinum, rhodium, iridium, |
| 3 | | palladium, ruthenium, and osmium. |

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